Deep Shah  CPE 462  Professor Man  3/31/25

5.2  Given a histogram from a image as shown, use histogram equalization to find a mapping function between input pixel values and output pixel values



$$S_K = T(r_K) = \text{Round} \left\{ (L-1) \sum_{i=0}^{r_K} p(r_i) \right\}$$

$p(r_i) = $ probability of each intensity

$r_K = $ Original intensity level (input pixel values)

$L = $ number of all possible amplitude values

5.2 (continued) $P(r_0) = 0.15$, $P(r_1) = 0.10$, $P(r_2) = 0.05$, $P(r_3) = 0.05$
$P(r_4) = 0.10$, $P(r_5) = 0.15$, $P(r_6) = 0.25$, $P(r_7) = 0.15$
$L = 8$, $\sum_{i=0}^{8} P(r_k) = 1$

$S_0 = $ Round $\left\{ (8-1) \sum_{i=0}^{0} P(r_0=0) \right\} = $ Round $\{ 7 \times 0.15 \} = 1$
$S_1 = $ Round $\{ 7 \times (0.15 + 0.10) \} = 2$
$S_2 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05) \} = 2$
$S_3 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05 + 0.05) \} = 2$
$S_4 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05 + 0.05 + 0.10) \} = 3$
$S_5 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05 + 0.05 + 0.10 + 0.15) \} = 4$
$S_6 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05 + 0.05 + 0.10 + 0.15 + 0.25) \} = 6$
$S_7 = $ Round $\{ 7 \times (0.15 + 0.10 + 0.05 + 0.05 + 0.10 + 0.15 + 0.25 + 0.15) \} = 7$

$P_{out}(0) = 0$ is no value for 0
$P_{out}(1) = P(r_0) = 0.15$
$P_{out}(2) = P(r_1) + P(r_2) + P(r_3) = 0.10 + 0.05 + 0.05 = 0.20$
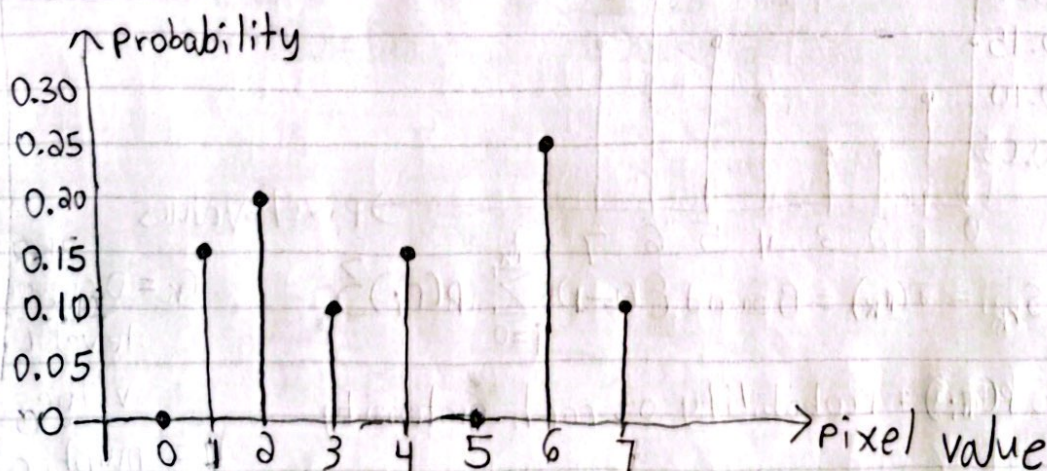$P_{out}(3) = P(r_4) = 0.10$
$P_{out}(4) = P(r_5) = 0.15$
$P_{out}(5) = 0$
$P_{out}(6) = P(r_6) = 0.25$
$P_{out}(7) = P(r_7) = 0.15$

Histogram Equalization



I pledge my honor that I have abided by the Stevens
Honor System. Deep A. Shah